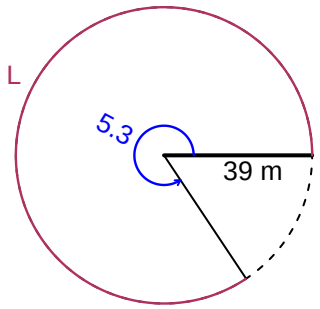
Name: Date:

Trig Final (Solution v48)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 39 meters. The angle measure is 5.3 radians. How long is the arc in meters?

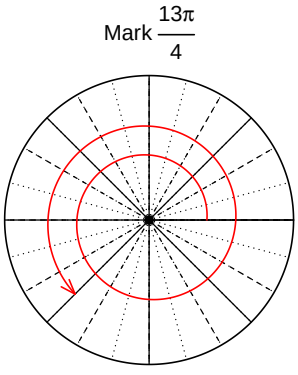


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

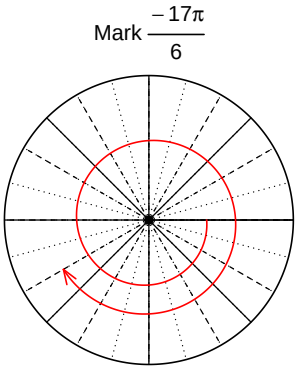
$L = 206.7$ meters.

Question 2

Consider angles $\frac{13\pi}{4}$ and $\frac{-17\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{13\pi}{4}\right)$ and $\cos\left(\frac{-17\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(13\pi/4)$



Find $\cos(-17\pi/6)$

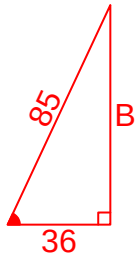
$\sin(13\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(-17\pi/6) = \frac{-\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{36}{85}$, and θ is in quadrant IV, determine an exact value for $\tan(\theta)$.

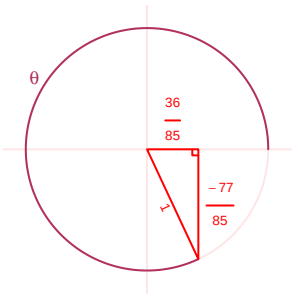
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$36^2 + B^2 = 85^2$$
$$B = \sqrt{85^2 - 36^2}$$
$$B = 77$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\tan(\theta) = \frac{\frac{-77}{85}}{\frac{36}{85}} = \frac{-77}{36}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 2.43 meters, a midline at $y = 8.8$ meters, and a frequency of 4.32 Hz. At $t = 0$, the mass is at the midline and moving up. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = 2.43\sin(2\pi 4.32t) + 8.8$$

or

$$y = 2.43\sin(8.64\pi t) + 8.8$$

or

$$y = 2.43\sin(27.14t) + 8.8$$